First NASA Quantum Future Technologies Conference

Conference Agenda: January 17–21, 2012

Ballroom, Building 3

NASA Ames Research Center

Moffett Field, California 94035

Tuesday, January 17, 2012

Tue (A) 11.30 - 12.20 Check-in and Welcome Reception

Tue (B) Opening Presentations
Session mediator: Gabriel Durkin (MCT/NASA-Ames)

(B0) 12.20   **Gabriel Durkin** (MCT/NASA-Ames) Opening remarks
(B1) 12.30   **David Korsmeyer** (NASA-Ames) Intelligent Systems and NASA missions.
(B2) 12.50   **Rupak Biswas** (NASA-Ames) High performance computing at NASA.
(B3) 13.10   **Alan Aspuru-Guzik** (Harvard) Quantum computing for chemistry and biology
(B4) 13.45   **Jonathan Dowling** (LSU) Quantum Sensors, Metrology, and Imaging

14.20 Break

Tue (C) Optical, Atomic and Solid State Quantum Computing
Session mediator: Sue Coppersmith (University of Wisconsin)

(C1) 14.40   **Mohammad Amin** (D-Wave, Canada) Experimental evidence for robustness of adiabatic quantum computation against decoherence
(C2) 15.15   **Andrew White** (University of Queensland) Quantum Optics for Quantum Information Science
(C3) 15.50   **Mark Saffman** (University of Wisconsin) Scalable quantum computing with neutral atom qubits
(C4) 16.25   **Mark A. Eriksson** (University of Wisconsin) Single-shot measurement of Si/SiGe quantum dot spin qubits
(C5) 17.00   **Daniel Loss** (University of Basel) Spin qubits in scalable 2D architectures

17.35 Break

Tue (D) Long-distance Quantum communication including Earth-Space links
Session mediator: Jeremy O Brien (Bristol, UK)

(D1) 17.55   **Will Marshall** (SGT/NASA-Ames) NASA Earth-Satellite Links: Phone Sat
(D2) 18.30   **Vikram Sharma** (QuintessenceLabs) Enterprise Security Services using continuous variable QKD
(D3) 19.05   **Paolo Villoresi** (Padova, Italy) Quantum Communications along Space Channels

Wednesday, January 18, 2012

Wed (A) Physics-based approaches to quantum computation
Session mediator: Ralf Schutzhold (Universität Duisburg-Essen)

(A1) 8.30   **Edward Farhi** (MIT)
(A2) 9.05   **Sue Coppersmith** (University of Wisconsin) Quantum random walks of interacting particles and the graph isomorphism problem
(A3) 9.40   **Peter Young** (UCSC)

10.15 Break

Wed (B) Applications for NASA of Quantum Metrology: Sensor Development, Navigation Tools and Gravity Wave Detection
Session mediator: Carl Caves (UNM)

(B1) 10.30   **Mark Kasevich** (Stanford) Atom systems and Bose Einstein Condensates for metrology and navigation
(B2) 11.05   **Nan Yu** (JPL) Opportunities and Development of Atomic Systems and Quantum Devices in Space
(B3) 11.40   **Rana Adhikari** (CalTech) Quantum enhancement to LIGO
(B4) 12.15   **Roman Schnabel** (Max-Planck, Hannover) A gravitational wave observatory operating beyond the quantum shot-noise limit: Squeezed light in application

12.50 - 14.00 Working Lunch: NASA Roadmap Strategy Discussion

Wed (C) Applications of Quantum Algorithms
Session mediator: Frank Gaitan (Laboratory of Physical Science)

(C1) 14.00   **Jeremy Frank** (NASA-Ames)
(C2) 14.35   **Cris Moore** (UNM & Santa Fe Institute) Let the Physics Do the Work: Scattering Algorithms for High-Dimensional Geometry
(C3) 15.10   **Daniel Lidar** (USC) Adiabatic quantum pagerank algorithm

15.45 Break

(C4) 16.05   **Sergio Boixo** (USC/ISI) Adiabatic quantum machine learning
(C5) 16.40   **Hartmut Neven** (Google) Robust Classification with Non-Convex Loss and Regularization designed for Adiabatic Quantum Computation

Wed (D) 17.20 NASA Kepler Project: A Search for Habitable Planets

Thursday, January 19, 2012

Thurs (A) Quantum sources, processes and detectors
Session mediator: Geoff Pryde (Griffith, Australia)

(A1) 8.30   **Bill Farr** (JPL) Efficient multiple photon discrimination

(A2) 9.05   **Nicolas Brunner** (Bristol, UK) Weak Measurements and Metrology

(A3) 9.40   **Alan Migdall** (NIST) Calibration of bright entanglement sources.

10.15 Break

Thurs (B) Quantum computing algorithms
Session mediator: Edward Farhi (MIT)

(B1) 10.30   **Peter Shor** (MIT) Quantum Algorithms

(B2) 11.05   **Wim van Dam** (UCSB) Quantum Algorithms on Data Streams

(B3) 11.40   **Edward Farhi** (MIT)

(B4) 12.15   **Andrew Childs** (Waterloo) The quantum query complexity of read-many formulas

12.50 - 14.00 Working Lunch: NASA Roadmap Strategy Discussion

Thurs (C) Photon systems for Quantum Computing and remote Entanglement-sharing
Session mediator: Andrew White (University of Queensland)

(C1) 14.00   **Ralf Schutzhold** (Universität Duisburg-Essen) Quantum pattern recognition with photons

(C2) 14.35   **Jeremy O Brien** (Bristol, UK) Quantum gates on an optical chip

(C3) 15.10   **Geoff Pryde** (Griffith, Australia) Photonic EPR-steering Experiments

15.45 - 17.45 Conference Photo, Google Field Trip

19.30 Conference Dinner

Friday, January 20, 2012

Fri (A) Adiabatic quantum computation
Session mediator: Jérémie Roland (University of Brussels)

(A1) 8.30	**Andrew Landahl** (Sandia National Laboratories) Adiabatic Quantum Computing at Sandia
(A2) 9.05	**Frank Gaitan** (Laboratory of Physical Science) Ramsey numbers and adiabatic quantum computing
(A3) 9.40	**Rolando Somma** (Los Alamos National Labs) Spectral Gap Amplification
(A4) 10.15	**Geordie Rose** (D-Wave Systems) Compressive sensing and semi-supervised feature learning using a D-Wave One system

10.50 Break

Fri (B) New Limits to measurement precision, including systems subject to noise
Session mediator: Matteo Paris (University of Milan)

(B1) 11.05	**Lorenzo Maccone** (Pavia, Italy) Quantum measurement bounds beyond the uncertainty relations
(B2) 11.40	**Sergey Knysh** (SGT/NASA-Ames) Rigorous bounds on precision of lossy interferometers and optimal probe states
(B3) 12.15	**Alfredo Luis** (University of Madrid, Spain) Nonlinearity challenges quantum metrology limits

12.50 - 14.00 Working Lunch: NASA Roadmap Strategy Discussion

Fri (C) Theory and Technologies for Quantum Metrology
Session mediator: Jonathan Dowling (LSU)

(C1) 14.00	**Carl Caves** (UNM) Quantum Limits on Noise in Linear Amplifiers
(C2) 14.35	**Rafal Demkowicz-Dobrzanski** (Warsaw) Theoretical tools for quantum enhanced metrology
(C3) 15.10	**Howard Wiseman** (Griffith, Australia) Robust Experimental Quantum Parameter Estimation Protocols

15.45 Break

(C4) 16.05	**Matteo Paris** (University of Milan) Quantum Estimation for Quantum Technology
(C5) 16.40	**Irfan Siddiqi** (UC Berkeley) Continuous High-Fidelity Monitoring of a Superconducting Qubit: From Quantum Jumps to Feedback

Fri (D) 17.15 Address by NASA Ames Center Director, Pete Worden, followed by Poster Presentation

Saturday, January 21, 2012

Sat (A) Quantum Interdisciplinary Topics
Session mediator: Daniel Lidar (USC)

(A1) 8.30   **Jérémie Roland** (University of Brussels) Quantum rejection sampling

(A2) 9.05   **Stephen Jordan** (NIST) Simulating quantum field theories on quantum computer

(A3) 9.40   **Alexander Ling** (Centre for Quantum Technologies)

10.15 Break

(A4) 10.35   **Colin Williams** (JPL) NASA Quantum Network

(A5) 11.10   **Rupert Ursin** (Austrian Academy of Sciences) Free-space quantum cryptography over 144 km and a mission proposal for going to space

(A6) 11.45   **Vadim Smelyanskiy** (NASA-Ames) Concluding talk

Sat (B) 12.20 Close

Posters

Massoud Borhani
(Laboratory for Physical Sciences)

Spin Manipulation and Relaxation in Spin-Orbit Qubits

Constantin Brif
(Sandia National Laboratories)

Robustness of Quantum Information Processing to Control Noise (with Grace, Sarovar and K.Young)

Amlan Chakrabarti
(Princeton University)

New Quantum Circuits for Quantum Random Walk Algorithms

Baris Erkmen
(Jet Propulsion Laboratory)

Approaching quantum limits of optical communication using a photon-counting detector

Matthew Grace
(Sandia National Laboratories)

Robustness of Quantum Information Processing to Control Noise (with Brif, Sarovar and Young)

Laszlo Gyongyosi
(Budapest University of Technology and Economics)

On-the-Fly Quantum Error-Correction for Space-Earth Quantum Communication Channels

Itay Hen
(University of California Santa Cruz)

Complexity of the Quantum Adiabatic Algorithm

Nathan Cody Jones
(Stanford University)

Simulating Chemistry Efficiently on Fault-Tolerant Quantum Computers

Rainer Kaltenbaek
(University of Vienna)

MAQRO - Macroscopic Quantum Resonators in Space

Na Young Kim
(Stanford University)

Solid-State Quantum Simulators based on Microcavity Exciton-Polaritons

Alexander Ling
(Centre for Quantum Technologies)

Entangled photon systems for Small Satellites

Arka Majumdar
(Stanford University)

Solid State Cavity QED with Quantum Dots coupled to Photonic Crystal Cavity

Jarrod McClean
(Harvard University)

The Union of Quantum Computing and Quantum Chemistry

Luke Pendo
(South Dakota School of Mines)

Quantum Computing with Lithium Donors in Silicon

Krzysztof Pomorski
(University of Warsaw)

Superconducting qudit and qutrit as the generalization of superconducting qubit architecture

Krzysztof Pomorski
(University of Warsaw)

Architecture and properties of Field Induced Josephson junction devices.

Kristen Pudenz
(University of Southern California)

Quantum Adiabatic machine learning

Mohan Sarovar
(Sandia National Laboratories)

Robustness of Quantum Information Processing to Control Noise (with Brif, Grace and Young)

Alireza Shabani
(UC-Berkeley)

Compressed Tomography of Quantum Dynamical Systems

Alexandre Tacla
(University of New Mexico)

Entanglement-based perturbation theory for highly anisotropic Bose-Einstein condensates

Justin Winkler
(University of Rochester)

Room-Temperature Single-Photon Source for Secure Quantum Communication

Kevin Young
(Sandia National Laboratories)

Robustness of Quantum Information Processing to Control Noise (with Brif, Grace and Sarovar)

Leo Yu
(Stanford University)

Tailoring Quantum Dot emission with Frequency Downconversion